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APPLICATION NO	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO	CONFIRMATION NO
09/905,320	07/13/2001	Cem Basceri	MI22-1657	6172

21567 7590 12/19/2001

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EXAMINER
FULLER, ERIC B

ART UNIT	PAPER NUMBER
1762	4

DATE MAILED: 12/19/2001

Please find below and/or attached an Office communication concerning this application or proceeding.

RT 4

Office Action Summary	Application	Applicant(s)	
	09/905,320	BASCERI ET AL.	
	Examiner	Art Unit	
	Eric B Fuller	1762	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 July 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-51* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-51* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *13 July 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *2,3* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in-
> (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or
> (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

Claims 1, 5-8, 10-15, 17, 18, 20-22, 24-34, and 36-38 are rejected under 35 U.S.C. 102(e) as being anticipated by Kang (US 6,127,218).

Kang teaches a process of varying the barium, strontium, and titanium compositions of a BST film by only adjusting the composition of the oxidation stream during a typical metallic organic chemical vapor deposition (MOCVD) process (column 3, line 9; abstract, column 5, line 15). The paragraph bridging columns 2 and 3 teaches that a first oxidant is supplied to the reactor, and then during the deposition, a second oxidant is supplied to make a 1:1 ratio (column, line 51) with the first oxidant. This change in composition of the oxidation stream determines the resulting composition of the BST film (Table 2). It is shown that the first oxidant is N_2O or NO_x and the second oxidant is O_2 or O_3, or vice-versa (column 3, 1st paragraph). Column 5, lines 10-15, teach that as the quantity of N_2O being fed to the reactor is increased, the amount of

strontium in the resulting film is increased. It is also taught that as the quantity of O_2 is increased, the amount of titanium in the resulting film is increased. The quantity of O_2 and N_2O being fed to the reactor is directly proportionally to the rate of flow. When adding the second oxidizer, two possibilities are present. Either the flow rate of the first oxidant remains constant or it is changed. If the flow rate is left constant, the addition of a second oxidant would increase the total oxidant flow rate, which would read upon the applicants limitation of changing the oxidant flow rate. If the flow rate of the first oxidant is changed when adding the second oxidant, then the "at least one oxidizer" flow rate has been changed as claimed by applicant. Kang only discusses controlling the [Sr]/[Ti] ratio from N_2O and O_2 flow rates and never teaches to vary the barium and strontium introduction rate. Therefore the process indicates a constant relative ratio of barium and strontium being fed to the reactor.

Table 2 shows examples of different manufacturing conditions. These examples, along with substituting the other possible oxidants (NO_x for N_2O and O_3 for O_2) as described above, meet the limitations of these claims. The limitations of providing a substrate in the reactor and providing the precursors are included in this reference as being conventional for MOCVD processes.

Claims 26-31, 47-49, and 51 are rejected under 35 U.S.C. 102(e) as being anticipated by Stauf et al. (US 6,277,436 B1).

Stauf teaches an MOCVD process that produces BST films wherein the oxidizing stream contains the gas or gases O_2, O_3, N_2O, or the like (column 15, line 53). These oxidizing agents may be formed by a remote plasma source (column 4, line 34). The

different combinations of oxidizing agents taught by Stauf read on the applicant's limitations for these claims. Stauf also teaches the substrate temperature to be 400 – 1200 degrees Celsius, which is inclusive of applicant's claimed range of below 550 degree Celsius. As no steps have been taken to alter the composition of the BST film throughout, it would be inherent that it would be homogonous.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 2-4 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kang (US 6,127,218).

Kang teaches the limitations of claim 1, as set forth above, but fails to teach the following three things:

(a) changing the flow rate of the oxidizing stream twice (claim 2 and 19),

(b) using two precursors: one for barium and one for strontium (claim 3), and

(c) mixing these precursors into one stream to be fed into the reactor (claim 4).

However, it would have been obvious at the time the invention was made to a person having ordinary skill in the art, after reading Kang, to change the rate of flow of the oxidation stream twice in order to achieve three layers of differing BST compositions. It also would have been obvious to one skilled in the art to have a

precursor for each metallic component of the film, as is necessary in a typical MOCVD process. To mix the barium and strontium streams into one would also have been obvious, as feeding the stream into one vaporizer would be more economical than two.

Claims 9, 16, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kang (US 6,127,218) in view of Gardner et al (US 6,245,652 B1).

As noted above, Kang teaches the limitations of claims 1 and 17 and by doing so teaches the use of "N_2O or NO_x" and "O_2 or O_3" as the two oxidants. This fails to teach using NO_x and N_2O as the combined oxidants (claim 16). However, Gardner teaches in MOCVD process that both NO_x and N_2O have a similar effect on the resulting composition of the BST film and can be used in combination (column 3, lines 35-50). To use the combined NO_x and N_2O in place of either one singularly would have been obvious at the time the invention was made to a person having ordinary skill in the art with the expectation of achieving similar results.

Kang also fails to teach the use of NO as essentially the only oxidant (claims 9 and 23), but does teach that as the quantity of N_2O is increased in the reactor, the amount of strontium in the BST film is increased (column 5, line 14). As Gardner teaches that NO would have the same effect as N_2O, it would have been obvious that an increase in flow of essentially only NO would increase the strontium composition in the BST film.

Claims 32, 33, 35-37, 39, 44, and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stauf et al. (US 6,277,438 B1) in view of Gardner et al. (US 6,245,652 B1).

Stauf teaches an MOCVD process that uses different mixtures of oxidants, including O_2, O_3, N_2O, or the like (column 15, line 53). However, Stauf fails to specifically teach that the mixture may include NO. Gardner teaches that NO and N_2O may be used interchangeably or in combination while still attaining similar results (column 3, lines 35-50). Therefore, it would have been obvious that "or the like" (as quoted by Stauf) would include NO. By including NO in the various mixture possibilities that exist in Stauf, the limitations to these claims are met.

Claims 32-46 and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stauf et al. (US 6,277,436) in view of Kang (US 6,127,218).

Within the possible combinations of oxidants that may exist, Stauf fails to specifically teach that the mixtures may include NO_x. However, Kang teaches that either the first or second oxidant can be NO_x or N_2O. From this, one of skill in the art would recognize that NO_x would be considered "of the like" in a list that included N_2O. The combinations that are possible by this substitution would meet the limitations of claims 32-46.

Furthermore, Stauf fails to teach a non-homogenous layer of BST. However, Kang, as shown above, teaches a method of altering the compositions of a BST layer by changing the oxidation stream. In order to produce a stacked capacitor, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to alter the oxidation streams taught by Stauf in a manner similar to that of Kang, thus achieving a non-homogenous film.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Table 3 of Tomozawa et al. (US 5,459,635) teaches that it is known to alter the flow rate and composition of the oxidation stream in order to achieve different BST compositions. Shinriki et al. (US 6,126,753) shows in figure 1 a typical MOCVD process wherein a substrate is provided in the reactor along with various precursors.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric B Fuller whose telephone number is (703) 308-6544. The examiner can normally be reached on Tuesday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck can be reached on (703) 308-2333. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-5408 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Eric B Fuller
December 14, 2001

TIMOTHY MEEKS
PRIMARY EXAMINER